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| **Lesson Title:** Web of Life in the Cedar Glades |
| **Subject area / course / grade level:** Life Science/Middle School |
| **Introduction:**  Introduce students briefly to the concept of a cedar glade, stressing the presence of rock, thin soil, and unique plants. As the soil depth increases, more plants, such as redcedar trees, will begin to grow. All terrestrial ecosystems require a constant input of energy of sunlight that is utilized by photosynthetic organisms (cyanobacteria like *Nostoc*, lichens such as Reindeer Lichen, Glade moss, and all the plants). From this initial input of energy, every organism on the planet interacts and depends on other organisms in its environment, and those interactions keep the community in balance. For example, predators keep the populations of their prey in check, preventing overcrowding and starvation; herbivores feed on plants and prevent them from crowding the other plants in the area; insects assist in pollinating flowers; small mammals eat seeds and then deposit them elsewhere later. Remove one part of this delicate balance and the whole structure suffers. A food chain is a very simple way of illustrating the energy (food) relationships between organisms, but it doesn’t tell the whole story. Very few organisms eat only one type of food. A food web is a much more accurate representation, with multiple connections between all the organisms in a habitat. |
| **Lesson Length:** 30 minutes to conduct but more time needed for student research |
| **Materials:**  Ball of yarn or string  Cedar Glade Species List or Cedar Glade Animal Cards (see Cedar Glade Activity Guide appendix or go to Center for Cedar Glade Studies website: [www.mtsu.edu/~gladectr](http://www.mtsu.edu/~gladectr) go to teacher resources page)  Large Index card for students  Whiteboard and markers, or chalkboard and chalk  Scissors |
| **Lesson Overview:**  Student will either select organisms that are part of the cedar glade food web or be assigned a certain organism. It is important the student understands the ecological niche, or role, the organism fills in the cedar glade prior to the activity. After students have researched their organism’s niche, they will stand facing each other in a circle. One person begins the connection (the teacher) as the energy of sunlight and to show the relationship of one organism to another, a ball of string is passed from one organism to another. The teacher passes the ball of string to a photosynthetic organism and explains the relationship between the sun and the plant. The person who received the ball of yarn finds another connection in the circle and passes the ball of string while explaining the relationship; this continues until all participants have been able to make a connection. The student may then decide the balance of plants and animals in a special environment, such as the cedar glade, and apply the concept to a larger area like a biome. |
| **Tennessee Standards:**  GLE 0507.2.1; 0507.2.2; 0507.2.3; 0507.3.1; 0607.2.2; 0607.10.3; 0707.1.2; 0707.3.2; 0807.5.4 |
| **Lesson objective(s):**   * TLW determine how energy and other materials transfer through the cedar glades * TLW describe the relationship between producers, consumers, decomposers, and scavengers * TLW explain the niche of a selected cedar glade organism and relate that to other species in cedar glades * TLW discuss the impact of species loss to an ecosystem |
| **ENGAGEMENT**   * The teacher will capture student interest by listing a sampling of organisms living in the cedar glade on the board. Include more organisms than the number of students in the class. The teacher will explain/review that all terrestrial life is dependent upon the energy of sunlight and that living things interact with each other in different capacities to obtain energy either directly from the sun or by consuming an organism that obtained energy from the sun. Students will attempt to identify the ecological role for the organisms listed on the board by listing a P (producer), C (consumer – what type: herbivore, carnivore, omnivore, detritivore, insectivore), D (decomposer), S (scavenger) * Students should ask themselves the following questions: What are these organisms? Where are they found? What is the relationship of these organisms to each other? How do I determine the relationship of these organisms to each other? |
| **EXPLORATION**   * After hearing their ideas about ecological roles, distribute the Cedar Glade Species List. Let students continue to investigate the listed species connections to the cedar glade, making corrections to their notes. * Each student will select one cedar glade organism to represent. They will write the name of the organism they selected to represent in large block letters on one side of the card and include notes on the back of a large notecard. Students can tape or hang the notecard on the front of themselves for others to view. * Place the students in a circle. * The teacher will begin by standing in the center and say, “I am the sun and represent the energy of sunlight radiating to Earth and I am passing my energy to (teacher picks a glade plant) Pyne’s Ground Plum which is a producer. Not only does this plant make sugar from the energy of sunlight but the fruits and tissues serve as food for other living things.” Hand the Pyne’s Ground Plum student the ball of string. NOTE: Instruct the students that are given the ball of string to hold tightly onto the string before tossing again to another student. * The student with the ball of string is a producer and will begin the web. After the student announces his/her choice loud enough for all to hear and offers an explanation (they must choose an organism that will have a relationship with the plant, i.e. eating pollen, nectar or consuming or decomposing the plant), the student then throws the ball of string to that student, preferably across the circle. That student catches the ball of string and the string web will develop as students find connections to all the organisms in the circle. * As the students are announcing their choices, guide them and solicit ideas from other students in the web if the student errs in a selection. * Continue until all students in the circle have been included. It is also fine for some students to have more than one connection (holding more than one string). |
| **EXPLANATION**   * The students are now standing in a circle with string connections to each other. To demonstrate the idea of interdependence of all things, tell the students to close their eyes. Explain that you will begin a ‘tug’ and when a student feels a tug on their string, they are to tug back. The idea is that all students in the web will feel a tug so there is a constant rhythm of tugging moving around the web. * Questions to ask the students: What does the ‘tug’ represent? Did some students receive a ‘tug’ from more than one source? Why? How are the different organisms in the web connected to each other? How are they connected to the energy of sunlight if they are not photosynthetic? |
| **ELABORATION**   * To elaborate on biodiversity relationships, choose some organisms to be removed from the food web for certain reasons (i.e. habitat loss, illegal hunting, disease). Cut the string where the student who chose that organism stands, and ask the students to observe the effect that one cut has on the web. * Remove another organism, and repeat. The collapse of the web should become very obvious. Attempt the ‘tug’ activity again to demonstrate the point. * Guiding questions: What is the impact of removing one organism from the web of life? What is the impact of the extinction of an organism from an ecosystem? What ecosystems are more vulnerable to collapse in the absence of one organism? What are keystone species in an ecosystem? How do scientists determine which species are keystone species in an ecosystem? What can be done to maintain species diversity in an ecosystem? * Vocabulary: producer, consumer, carnivore, omnivore, detritivore, insectivore, scavenger, decomposer, biodiversity, keystone species |
| **EVALUATION**   * Students can demonstrate that they have achieved the lesson objective through a journaling assignment:   Suppose a major producer or consumer is eliminated from the area because of human activity. You are now a reporter for a scientific magazine. Report on what your discoveries found 50 years after the loss. What changes occurred? What had happened? Write a one page article sharing your findings after the loss.   * Students can demonstrate an understanding of concepts and be given a smaller set of organisms unique to cedar glades and create on paper, an individual food web by drawing connections between the organisms and explaining the relationship. * A map of the activity conducted can be recreated with the names of the species selected by students arranged in the same manner that students stood in a circle. Students can recreate the web, by drawing connections to species and listing what each relationship is between those selected. |